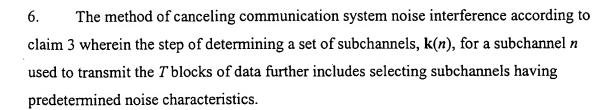


WHAT IS CLAIMED IS:

- 1. A method of canceling communication system noise interference, the method comprising the steps of:
 - a) receiving T blocks of data, Y(:, t), t = 1, ..., T, comprising T blocks of data, X(:,t), t = 1, ..., T, transmitted over predetermined subchannels;
 - b) determining a set of subchannels, k(n), for the multichannel frequency domain equalizer (FEQ) for subchannel n;
 - c) generating multichannel FEQ coefficients, g(n), for the n^{th} subchannel used to transmit the data; and
 - d) performing multichannel (FEQ) for subchannel n using the generated multichannel FEQ coefficients.
- 2. The method of canceling communication system noise interference according to claim 1 wherein steps b-d are repeated for each subchannel n used to transmit the T blocks of data.
- 3. The method of canceling communication system noise interference according to claim 1 wherein the step of determining a set of subchannels, k(n), for a subchannel n used to transmit the T blocks of data includes selecting subchannel n.
- 4. The method of canceling communication system noise interference according to claim 3 wherein the step of determining a set of subchannels, $\mathbf{k}(n)$, for a subchannel n used to transmit the T blocks of data further includes selecting neighboring subchannels to subchannel n.
- 5. The method of canceling communication system noise interference according to claim 3 wherein the step of determining a set of subchannels, k(n), for a subchannel n used to transmit the T blocks of data further includes selecting subchannels where radio frequency interference is located.





- 7. The method of canceling communication system noise interference according to claim 1 wherein the step of generating multichannel FEQ coefficients, g(n), for subchannel n, comprises solving the equation $g(n) = Y(n)^{-1} x(n)$, where $Y(n)^{-1}$ is the pseudoinverse of a matrix of received data for subchannels k(n), and x(n) is a vector of transmitted data for subchannel n.
- 8. The method of canceling communication system noise interference according to claim 7 wherein g(n) is determined adaptively using a block of received data at a time according to an equation defined by: $g(n) = g(n) + \mu(t)e(t)Y(k(n),t)^*$, where g(n) is the vector of multichannel FEQ coefficients for subchannel n and $Y(k(n),t)^*$ is the conjugate of a matrix of received data for subchannels k(n).
- The method of canceling communication system noise interference according to claim 8 wherein values of e(t) are determined according to an equation defined by: $e(t) = X(n,t) \mathbf{Y}(\mathbf{k}(n),t)^T \mathbf{g}(n)$, where X(n,t) is the transmitted data for subchannel n at time t, and $\mathbf{Y}(\mathbf{k}(n),t)^T$ is the transpose of a matrix of received data for subchannels $\mathbf{k}(n)$.
- 10. The method of canceling communication system noise interference according to claim 8 wherein $\mu(t)$ controls the adaptation according to least mean squares and has a value determined according to an equation defined by: $\mathbf{R} = E[\mathbf{Y}(\mathbf{k}(n),t)\mathbf{Y}(\mathbf{k}(n),t)^H]$, where $\mathbf{Y}(\mathbf{k}(n),t)^H$ is the conjugate transpose of a matrix of received data for subchannels $\mathbf{k}(n)$.



- 11. The method of canceling noise interference according to claim 8 wherein $\mu(t)$ controls the adaptation according to normalized least mean squares and has a value determined according to an equation defined by: $\mu(t) = \frac{\alpha}{\beta + \mathbf{Y}(\mathbf{k}(n), t)^H \mathbf{Y}(\mathbf{k}(n), t)}$, where $\alpha \in (0, 2)$, $0 \le \beta$, and $\mathbf{Y}(\mathbf{k}(n), t)$ is a matrix of received data for subchannels $\mathbf{k}(n)$.
- 12. The method of canceling noise interference according to claim 8 wherein $\mu(t)$ controls the adaptation according to power normalized least mean squares and has a value α determined according to an equation defined by: $\mu(t) = \frac{\alpha}{\sigma^2(t)}$, where $\sigma^2(t) = c\sigma^2(t-1) + \left| e(t) \right|^2$, $c \in (0,1)$, and $0 < \alpha < \frac{2}{M}$.
- 13. A system for canceling communication system noise interference, the system comprising:

a multichannel frequency domain equalizer configured to receive T blocks of data, $\mathbf{Y}(:,t), t=1,\ldots,T$, comprising T blocks of data, $\mathbf{X}(:,t), t=1,\ldots,T$, transmitted over predetermined subchannels, wherein the multichannel frequency domain equalizer is operational to generate multichannel frequency domain equalization (FEQ) coefficients, $\mathbf{g}(n)$, associated with the n^{th} subchannel used to transmit the data, and to perform multichannel FEQ for the n^{th} subchannel using the generated multichannel FEQ coefficients, and further wherein the FEQ coefficients are associated with a set of subchannels, $\mathbf{k}(n)$, for the n^{th} subchannel used to transmit the T blocks of data.

- 14. The system according to claim 13 wherein the FEQ is operational to increase a subchannel signal-to-noise ratio beyond that achievable using a single channel FEQ.
- 15. The system according to claim 13 wherein the FEQ is operational to cancel correlated subchannel noise caused by deterministic noise spreading associated with a plurality of subchannels.

